

H-S Group.—The elements of this group when subject to a very soft X-radiation emit an almost perfectly scattered radiation of intensity proportional to the mass of radiating substance traversed by a beam of definite intensity.

This conclusion has been based on observations of absorbability, ionising power, polarisation, and distribution of intensity of the secondary rays.

With a moderately penetrating primary the scattering becomes less perfect—as shown by the above tests—and with a very penetrating primary beam there is considerable difference in character between the secondary and primary rays. This is not due to a superposition of a second radiation on the purely scattered; the purely scattered disappears, and in its place is a radiation more absorbable than the primary producing it, one which is less completely polarised, possesses greater ionising power, and is distributed in a way which exhibits less perfect control of the primary pulses over the radiating electrons.

Cr-Zn Group.—A striking characteristic of this group is the enormous ionisation produced by the secondary beams—of the order of 100 times that produced by an equal mass of one of the (H-S) group. This radiation, though produced by a heterogeneous primary, consists almost entirely of homogeneous rays of a very absorbable type. For certain primary beams there appears to be a more or less perfectly scattered radiation (producing 1 per cent. or 2 per cent. of the total ionisation) mixed with this.

Some remarkable properties of these homogeneous radiations have been referred to in a paper published by us. Their intensity is for large ranges in the penetrating power of the primary proportional to the ionisation produced by the primary beam in a thin film of air, so that it is highly probable that the radiation is produced during the process of ionisation in the radiating substance.

This radiation has not been found to disappear with any changes we have made in the primary beam.

Ag-I Group.—This group is characterised by its sensitiveness to changes in the character of the primary rays when they are of ordinary penetrating power. Though for moderately penetrating primary beams the secondary rays are heterogeneous and do not differ in penetrating power very considerably from the primary, they do not exhibit the polarisation effect and are not distributed in the manner showing scattering as exhibited by rays from the H-S group. These rays are not superposed on a radiation which could be classified with that from the H-S group. We have recently found, however, that some of the group (if not all) may be reduced to order by using a very easily absorbed primary. In this case there appears by every test made to be almost perfect scattering. The intensity, however, appears to be several times as great as that from an equal mass of a substance in the H-S group.

W-Bi Group.—These substances much more closely resemble the Cr-Zn group in the intensity and constancy in character of the rays they emit. They have, however, not yet been examined carefully.

Substances with atomic weights between those in the above-mentioned groups possess some of the characteristics of the two groups between which they lie. It appears possible that similarity in behaviour of all the different groups will be discovered by great variation in the penetrating power of the primary beams—one group when subject to a certain kind of primary beam behaving as another group when subject to a primary of different penetrating power.

The above grouping has, however, been based on the behaviour when subject to beams of ordinary penetrating powers, and the generalisations hold with very few exceptions.

C. G. BARKLA.

C. A. SADLER.

University of Liverpool, January 31.

Auroral Characteristics of Clouds.

THE question has often been raised as to a possible connection between the aurora and the formation of clouds in the upper atmosphere. Observers in high latitudes have described cases in which, after a bright aurora, clouds have retained in some measure the forms of the previous

light display. In other cases high clouds have been observed to arrange themselves in a formation very similar to the arch and streamers which are so characteristic of the aurora.

It may be of interest to those who have studied this question to record an exhibition of the latter kind which was observed here yesterday evening. During the greater part of the day the sky had been overcast with altostratus clouds, which, as usual, began to dissipate soon after sunset. Between ten and eleven o'clock (local time) the greater part of the sky was clear, but there remained in the south a mass of light cloud which formed an arch, from which bands spread out in all directions as if radiating from a point on the horizon under the middle of the arch. The effect was remarkably like an aurora except that there was no rapid motion of the bands or streamers. So far as I could judge from the Pole Star, the centre of the arch was due south, and its top about 5° above the horizon, but being on the river at the time in a native boat I had no means of making accurate measurements. Small masses of cloud in other parts of the sky exhibited wave lines, but they did not appear to be parallel to the main streamers, nor did the latter look like a wave formation. In about half an hour the outlines had lost their sharpness, and the whole effect became that of a light, diffuse mass of cloud.

The interest in this observation is two-fold. Those who hold that the clouds which take upon themselves the form of the aurora are due to the same causes as the aurora will be interested to know that this formation can be seen within 16° of the equator, and also that the centre of the arch appeared to be due south. Those, on the other hand, who hold that there is no connection between the two phenomena will feel their position strengthened in that an almost exact imitation of the aurora has been seen in the clouds in a region which is supposed to be almost entirely free from the aurora, thus lending support to the idea that such a formation is only one of the infinite number of possible cloud formations.

GEORGE C. SIMPSON.

Moulmein, Burma, January 13.

Reissner's Fibre in the Frog.

IN October last, at the suggestion of Prof. Dendy, I undertook an investigation into the structure known as Reissner's fibre, which, Sargent's work notwithstanding, is still regarded by many as an artifact or as a coagulum of cerebro-spinal fluid, Johnston even, in his recent work on the "Nervous System of Vertebrates," dismissing the subject with the briefest of notices.

As a more than ordinary interest attaches to the description of any hitherto unrecorded feature in such a well-known type as the frog (*R. temporaria*), I venture to direct the attention of anatomists and physiologists to the fact that this animal possesses a well-developed and easily demonstrable Reissner's fibre, although no reference to this structure can be found in Gaupp's exhaustive treatise, nor does Sargent include any Anuran form in the long list given by him of animals in which he has seen the fibre.

The whole or parts of the central nervous system of about a dozen frogs have been sectioned, the sections having been cut in the usual three planes, and the fibre has been found in all the series examined, showing very definite and constant relations to the various brain structures. In every case it may be made out, beginning anteriorly at the dorsal end of the deep and narrow ependymal groove on the anterior face of the posterior commissure, and, emerging from this groove ventral the commissure, lying freely in the iter spanning the cavity between posterior commissure and cerebellum. It is somewhat closely applied to the ventral surface of the cerebellum, but posteriorly it slopes steeply towards the floor of the fourth ventricle and continues backward, with a wavy course throughout its length, to the hind end of the spinal cord near the floor of the canal.

Beneath the posterior commissure, in one specimen at least, it may be observed dividing into two or more finer fibres, while in the posterior half of its length numerous fine fibre-like structures may be made out, apparently given off to enter the substance of the spinal cord (much as Sargent has described for other forms), but that these

are truly given off by the fibre, and are not merely coagula, I have not yet been able to determine.

In transverse sections a definite sheath to the fibre can be seen, although the fibre itself is not readily made out in these sections until a certain familiarity with its course has first been obtained from an examination of sagittal sections. In the one fibre measured, the diameter was a little more than 6μ .

I did not find in any of my preparations that the fibre curled up into the "tangle" or "snarl" as described by Sanders in *Myxine*, by Dendy in *Geotria*, and mentioned by Sargent as commonly occurring, but this may probably be attributed to the precaution that was taken in every case thoroughly to fix and harden the central nervous system before severing the spinal cord. (The brain and spinal cord of several of the smaller specimens were cut entire in sagittal sections.) In all cases the central nervous system was dissected out entire from the freshly killed animal, and, where practicable, under the actual preserving fluid. Zenker's fluid, which did not admit of this, gave less satisfactory results than Flemming's stronger fluid. The stain employed was a modification of Weigert's suggested by C. Judson Herrick.

I have compared the fibre seen in sections so prepared with that shown in sections of *Petromyzon fluviatilis* in the laboratory collection at King's College, and also with that shown in Prof. Dendy's *Geotria* sections, which were prepared by altogether different methods, and the comparison leaves no doubt in my mind that we have here to do with a perfectly normal structure, and one cannot but express wonder that an object so clearly defined should have for so long escaped notice in the frog.

GEORGE E. NICHOLLS.

King's College, London, February 6.

Rhynchobdella aculeata in Ceylon.

It seems worth while to make a special note of the occurrence of the above-named food-fish in the inland waters of Ceylon. Its near ally, *Mastacembelus armatus*, has long been known to occur here. The general Ceylonese term for fishes belonging to the family Rhynchobdellidae, commonly known as "spined" or "thorny-backed eels," though not nearly related to the true eels, is "telliya," but the natives distinguish between the "Gang-telliya" (river-telliya), which is *Mastacembelus armatus*, and the "Batakola-telliya" (alluding to the lanceolate form of the body), which is *Rhynchobdella aculeata*. The latter is reputed to grow to a length of 15 inches, and I recently examined one of 12 inches. In the former, commoner species, the vertical fins are confluent and the dorsal spines are numerous (about thirty-eight); in the second species, which has not previously been recorded from Ceylon, the dorsal and anal fins are separated from the caudal by a notch above and below; the dorsal spines are less numerous (sixteen), and the long, fleshy snout, which gives these fishes such a remarkable, antiquated appearance, is transversely ribbed below. The identification is therefore not open to doubt.

The Rhynchobdellidae, as a family, are "excellent as food," to quote the words of the late Dr. Francis Day, and the hitherto unsuspected presence of an important member of the family in Ceylon affords an illustration of the incompleteness of knowledge concerning the biological conditions of the local inland fisheries. The batakola-telliya is stated to be absent from Malabar, a peculiarity of distribution which ranges it roughly in the same category with *Channa orientalis*, *Polyacanthus signatus*, and perhaps a few other fresh-water fishes.

ARTHUR WILLEY.

Colombo Museum, January 20.

Poseidonius on the Originator of the Theory of Atoms.

In Strabo's "Geography," book xvi., chapter xi., § 24, in the description of Sidon, we find the following remark:—

"If we are to believe Poseidonius, the ancient opinion about atoms originated with Mochus, a native of Sidon, who lived before the Trojan times."

This tracing of the theory of atoms to an authority

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much more ancient than Democritus does not seem to be mentioned in any of the works on physics, but as it is from the usually accurate Strabo, and rests on the high authority of Poseidonius, it seems worthy of notice.

T. J. J. SEE.

Naval Observatory, Mare Island, California,
January 27.

AGRICULTURAL AND HORTICULTURAL RESEARCH.¹

NO better evidence can be adduced of the growing interest in agricultural education and research in this country than the support which has been given to them by the county councils of Surrey and Kent during the last few years. They have materially promoted the science of agriculture and horticulture by furnishing the necessary means for the annual publication of such valuable reports as the one which

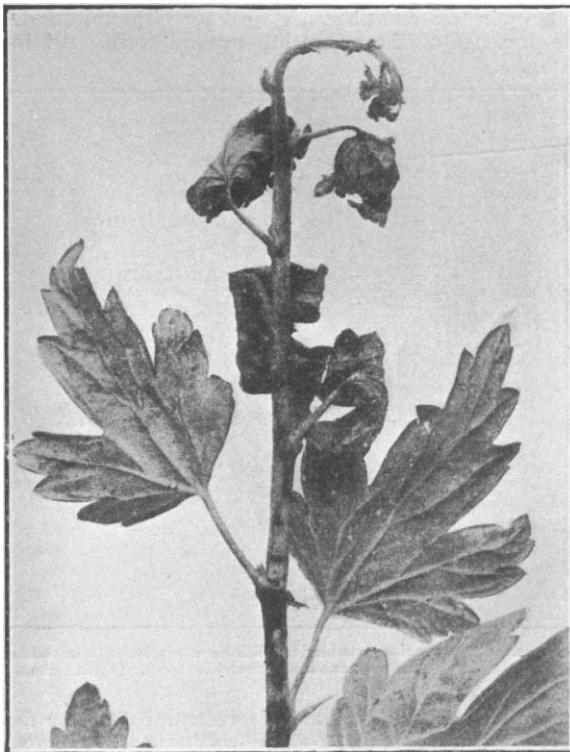


FIG. 1.—Gooseberry shoot attacked by the American Gooseberry-mildew. Numerous dark scurfy patches of the spawn of the mildew can be seen on the stem.

has recently been issued from the South-eastern Agricultural College at Wye, Kent.

The report gives the results of an immense amount of painstaking investigation, and the exhaustive way in which the subjects are treated will be appreciated when it is realised that a bulky volume of 438 pages has been produced by the combined labours of the various members of the staff. The work is well written, and the different subjects are presented with pleasing freshness. Altogether we feel that it will prove a veritable mine of immensely valuable information, enhanced in no small degree by some of the most beautiful half-tone illustrations which we have yet seen in a work of this kind.

¹ University of London. "The Journal of the South-eastern Agricultural College, Wye, Kent." No. 16. Pp. ix+428. (London and Ashford, Kent: Headley Brothers, 1907.) Price 6s.; for Residents in Kent and Surrey, 3s.